

ENVIRONMENTAL PRODUCT DECLARATION

# OpenAir™ – Electromotoric Rotary Damper Actuators

## GA..., GED..., GM..., GN..., Actuators

Type II according to ISO 14021 including life cycle impact assessment (LCIA)




SIEMENS

# General information

This environmental product declaration (EPD) is based on the international standard ISO 14021 (“Environmental labels and declarations – Self declared environmental claims – Type II environmental labelling”). The data in this EPD has been evaluated on a full-scale life cycle assessment (LCA) study according to ISO 14040/44, taking into account the product category rules (PCR) for electronic and electrotechnical products and systems defined in EN 50693.

Siemens is dedicated to an environmentally conscious design of its products in line with IEC 62430 and has implemented an integrated management system according to ISO 9001, ISO 14001 and ISO 45001.

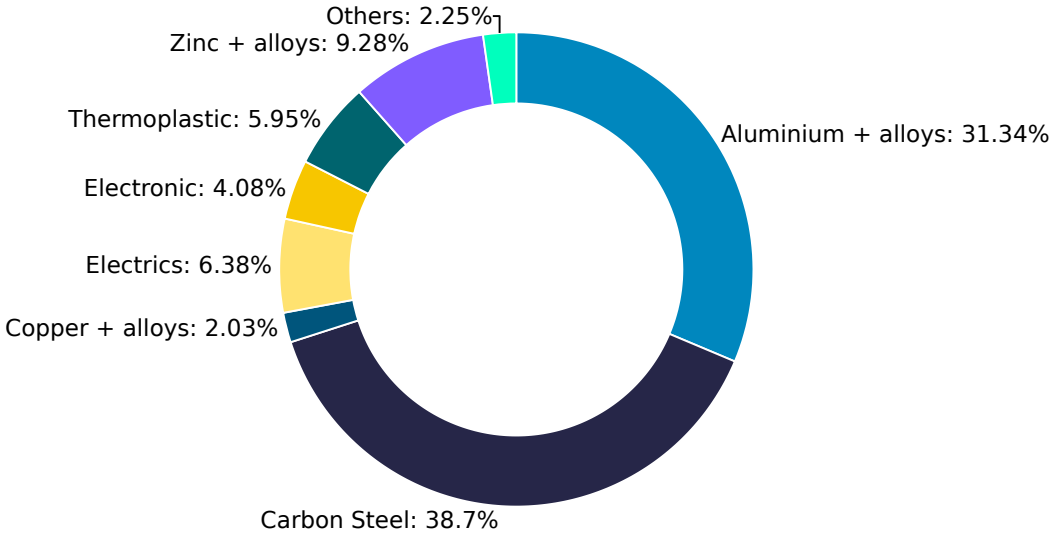
| **Products** | **All products which can be found in the appendix.** |
|---|---|
| **Represented by the reference product** | BPZ:GMA161.1E (GMA161.1E) |
| **Product Description** | Electromotoric actuator for 2-position, 3-position, or modulating control for HVAC and fire and smoke protection applications. |
| **Functional Unit** | The damper actuator positions an air damper in an air handling unit with 3% runtime over a reference lifetime of 10 years.[1] |

[1] The lifetime value used for calculation is a reference value and does not equate with the minimum, average or real life time.

# Material composition

The following chart outlines the overall material composition of the calculated reference product without packaging. Product weight of 1.16 kg adds up with packaging weight of 0.09 kg to a total weight of 1.25 kg. Packaging consists of: PE film, Corrugated box (average composition), Graphic paper.

**Product Weight 1.16 kg**



# Substance assessment

At Siemens, we are committed to the development and production of environmentally sound and sustainably produced equipment. This includes avoiding hazardous substances in our products without compromising their benefits for our customers. Please visit the following website to learn more about how we comply with product-related environmental regulations like RoHS, REACH, WEEE and others: Product Related Environmental Protection

# Life cycle stages and reference scenarios



## Manufacturing

This stage covers the extraction of natural resources, production of raw materials, manufacturing, packaging, and transportation.



## Distribution and Operation

This stage covers the product's distribution, installation, use, and maintenance. Different operating conditions can lead to deviations from the reference scenario.



## End-of-Life

This stage covers the disassembly or shredding and material recycling of all recyclable materials, as well as energy recovery, thermal treatment and the disposal of all other materials.

**Scenarios**

**Energy model used:**
Singapore (standard mix),
China (standard mix),
Switzerland (standard mix),
Italy (standard mix),
Slovenia (standard mix)

**Transportation model:**
EN 50693

**Energy model used:**
Europe (standard mix)

**Distribution scenario:**
Truck (20-26 t) 1558 km

**Use Scenario:**
Energy consumption in standby 2.5 W and run 3.5 W
3.00% runtime
Reference lifetime 10 years

**Energy model used:**
EMEA

**End-of-Life methodology:**
Avoided burden (net-scrap calculation)

# Key environmental performance indicators

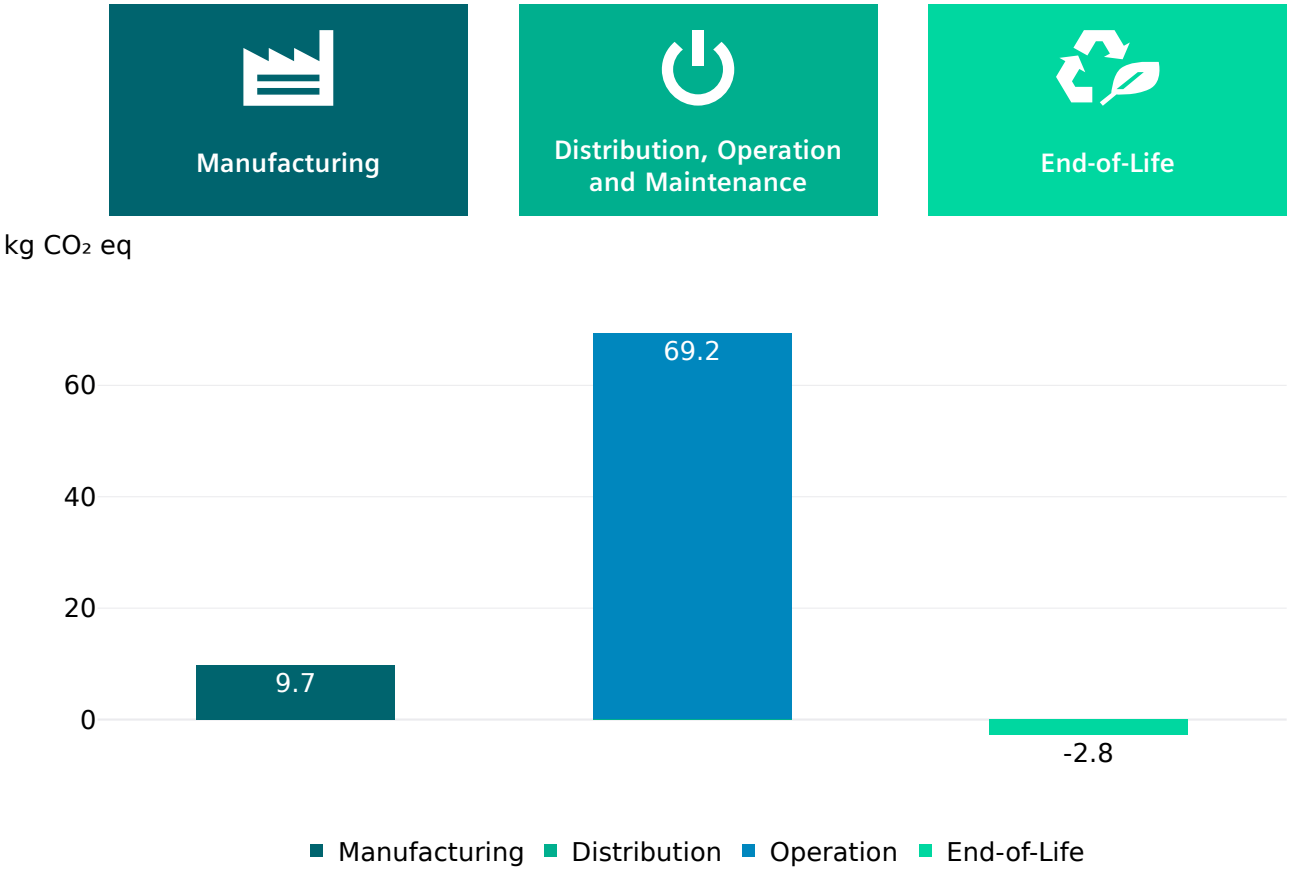
The following impact categories characterize the product's environmental footprint. They have been calculated with LCIA methodology EF3.1; LCA tool: Green Digital Twin (GDT), Database: One Siemens LCA Database (based on MLC CUP 2023.2, formerly GaBi).

To ensure the high quality and completeness of the LCA results, Primary Data have been used whenever possible. Datasets for resources, such as electrical energy or natural gas, are chosen from the region where the device is produced and assembled. If primary data are not available, datasets reflecting state-of-the-art manufacturing technology are considered.

| Impact Category | Unit | Total | Manufacturing | Distribution | Operation | End-of-life |
|---|---|---|---|---|---|---|
| Acidification | Mole of H+ eq | 4.25E-1 | 3.02E-1 | 2.51E-4 | 1.46E-1 | -2.29E-2 |
| Climate change – total | kg $CO_2$ eq | 7.63E+1 | 9.70E+0 | 1.84E-1 | 6.92E+1 | -2.83E+0 |
| Climate change – fossil | kg $CO_2$ eq | 7.56E+1 | 9.68E+0 | 1.81E-1 | 6.86E+1 | -2.83E+0 |
| Climate change – biogenic | kg $CO_2$ eq | 6.25E-1 | 1.82E-2 | 4.93E-4 | 6.07E-1 | -7.06E-4 |
| Climate Change, land use and land use change | kg $CO_2$ eq | 1.43E-2 | 8.21E-3 | 1.70E-3 | 7.48E-3 | -1.34E-3 |
| Ecotoxicity, freshwater – total | CTUe | 4.39E+2 | 4.40E+1 | 1.79E+0 | 4.01E+2 | -7.25E+0 |
| Eutrophication, freshwater | kg P eq | 2.88E-4 | 3.22E-5 | 6.71E-7 | 2.57E-4 | -1.44E-6 |
| Eutrophication, marine | kg N eq | 6.75E-2 | 3.47E-2 | 8.79E-5 | 3.50E-2 | -2.34E-3 |
| Eutrophication, terrestrial | Mole of N eq | 7.21E-1 | 3.79E-1 | 1.05E-3 | 3.66E-1 | -2.46E-2 |
| Human toxicity, cancer – total | CTUh | 3.63E-8 | 1.41E-8 | 3.63E-11 | 2.12E-8 | 1.00E-9 |
| Human toxicity, non-cancer – total | CTUh | 6.06E-7 | 1.33E-7 | 1.62E-9 | 3.38E-7 | 1.33E-7 |
| Ionising radiation, human health | kBq U235 eq | 3.84E+1 | 5.95E-1 | 7.00E-4 | 3.80E+1 | -1.90E-1 |
| Land Use | dimensionless (pt) | 6.16E+2 | 5.17E+1 | 1.04E+0 | 5.68E+2 | -4.67E+0 |
| Ozone depletion | kg CFC-11 eq | 3.15E-9 | 1.90E-9 | 2.39E-14 | 1.27E-9 | -1.10E-11 |
| Particulate matter | Disease incidences | 2.99E-6 | 2.01E-6 | 1.84E-9 | 1.23E-6 | -2.45E-7 |
| Photochemical ozone formation, human health | kg NMVOC eq | 1.92E-1 | 1.06E-1 | 2.18E-4 | 9.34E-2 | -7.75E-3 |
| Resource use, fossils | MJ | 1.53E+3 | 1.26E+2 | 2.50E+0 | 1.44E+3 | -3.38E+1 |
| Resource use, mineral and metals | kg Sb eq | 2.03E-4 | 5.54E-4 | 1.22E-8 | 1.06E-5 | -3.62E-4 |
| Water use | $m^3$ water eq deprived water | 1.77E+1 | 3.11E+0 | 2.22E-3 | 1.51E+1 | -5.39E-1 |

# Climate change

This chart shows the overall impact of the product on climate change – total. The operations phase is the lifecycle phase with the biggest overall impact. Different operating conditions can lead to deviations from the reference scenario.




# End-of-Life results

The end-of-life stage was modelled by shredding of the device, followed by sorting and material separation process.

It leads to:

- **an overall** product recyclability of up to 83% mainly due to metal content
- **an** energy recoverability of up to 6% from plastic materials
- **a** minimum disposal rate of 11%

The exact final values depend on the used recycling process and add up to 100%.

**Note:** The device should not be disposed of as unsorted municipal waste. Special treatment for specific components may be mandated by law or recommended for environmental reasons. Observe all local and applicable laws.

# Appendix

## Scaling factors

The results of the LCA of the reference product can be extrapolated to other products of a homogeneous product family according to the standard EN50693. The scaling factors listed here are calculated according to this standard.

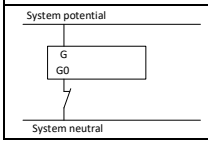
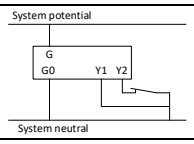
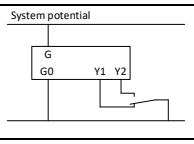
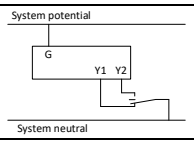
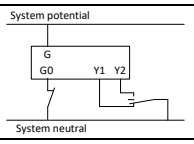
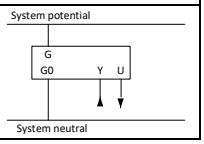
To extrapolate the impact from the reference product to another product from the range, multiply the following scaling factors to the impact category per life cycle stage from page 4:

| Article Type | Manufacturing | Distribution | Operation | End-of-Life | Control type* |
|---|---|---|---|---|---|
| GAP151.1P | 1.14 | 0.95 | 2.03 | 0.95 | Modulating - NFS |
| GAP156.1P | 1.20 | 1.07 | 2.03 | 1.07 | Modulating - NFS |
| GAP191.1E | 1.12 | 0.93 | 2.00 | 0.93 | 2P- NFS (3 Wire) |
| | | | 2.04 | | 3P-Floating - NFS (4 Wire) |
| | | | 2.04 | | Modulating - NFS |
| GAP191.1E/09R | 1.12 | 0.93 | 2.00 | 0.93 | 2P- NFS (3 Wire) |
| | | | 2.04 | | 3P-Floating - NFS (4 Wire) |
| | | | 2.04 | | Modulating - NFS |
| GAP191.1E/25W | 1.12 | 0.93 | 2.00 | 0.93 | 2P- NFS (3 Wire) |
| | | | 2.04 | | 3P-Floating - NFS (4 Wire) |
| | | | 2.04 | | Modulating - NFS |
| GAP191.1P | 1.14 | 0.95 | 2.00 | 0.95 | 2P- NFS (3 Wire) |
| | | | 2.04 | | 3P-Floating - NFS (4 Wire) |
| | | | 2.04 | | Modulating - NFS |
| GAP196.1E | 1.19 | 1.05 | 2.00 | 1.05 | 2P- NFS (3 Wire) |
| | | | 2.04 | | 3P-Floating - NFS (4 Wire) |
| | | | 2.04 | | Modulating - NFS |
| GAP196.1E/09R | 1.19 | 1.05 | 2.00 | 1.05 | 2P- NFS (3 Wire) |
| | | | 2.04 | | 3P-Floating - NFS (4 Wire) |
| | | | 2.04 | | Modulating - NFS |
| GAP196.1P | 1.20 | 1.07 | 2.00 | 1.07 | 2P- NFS (3 Wire) |
| | | | 2.04 | | 3P-Floating - NFS (4 Wire) |
| | | | 2.04 | | Modulating - NFS |
| GED331.1A | 2.02 | 0.89 | 0.06 | 0.89 | 3P-Floating - NFS (3 Wire) |
| GED332.1A | 1.95 | 0.95 | 0.06 | 0.95 | 3P-Floating - NFS (3 Wire) |

| Article Type | Manufacturing | Distribution | Operation | End-of-Life | Control type* |
|---|---|---|---|---|---|
| GED336.1A | 2.07 | 0.97 | 0.06 | 0.97 | 3P-Floating - NFS (3 Wire) |
| GMA121.1E | 0.92 | 0.96 | 0.37 | 0.96 | 2P- FS (2 Wire) |
| GMA121.1P | 0.92 | 0.96 | 0.37 | 0.96 | 2P- FS (2 Wire) |
| GMA121.1U | 0.92 | 0.96 | 0.37 | 0.96 | 2P- FS (2 Wire) |
| GMA126.1E | 0.99 | 1.08 | 0.37 | 1.08 | 2P- FS (2 Wire) |
| GMA126.1E/50H | 1.25 | 1.56 | 0.37 | 1.56 | 2P- FS (2 Wire) |
| GMA126.1P | 0.99 | 1.08 | 0.37 | 1.08 | 2P- FS (2 Wire) |
| GMA126.1U | 0.99 | 1.08 | 0.37 | 1.08 | 2P- FS (2 Wire) |
| GMA131.1E | 0.93 | 0.98 | 0.81 | 0.98 | 3P-Floating - FS (4 Wire) |
| GMA131.1P | 0.93 | 0.98 | 0.81 | 0.98 | 3P-Floating - FS (4 Wire) |
| GMA131.1U | 0.93 | 0.98 | 0.81 | 0.98 | 3P-Floating - FS (4 Wire) |
| GMA132.1U | 0.97 | 1.04 | 0.81 | 1.04 | 3P-Floating - FS (4 Wire) |
| GMA136.1E | 1.00 | 1.10 | 0.81 | 1.10 | 3P-Floating - FS (4 Wire) |
| GMA136.1U | 1.00 | 1.10 | 0.81 | 1.10 | 3P-Floating - FS (4 Wire) |
| GMA151.1P | 1.00 | 1.00 | 1.00 | 1.00 | Modulating - FS |
| GMA151.1U | 1.00 | 1.00 | 1.00 | 1.00 | Modulating - FS |
| GMA156.1P | 1.07 | 1.12 | 1.00 | 1.12 | Modulating - FS |
| GMA156.1U | 1.07 | 1.12 | 1.00 | 1.12 | Modulating - FS |
| **GMA161.1E** | **1.00** | **1.00** | **1.00** | **1.00** | **Modulating - FS** |
| GMA161.1E/MO | 1.00 | 1.00 | 1.00 | 1.00 | Networked - FS |
| GMA161.1H | 1.13 | 1.23 | 1.00 | 1.23 | Modulating - FS |
| GMA161.1P | 1.00 | 1.00 | 1.00 | 1.00 | Modulating - FS |
| GMA161.1U | 1.00 | 1.00 | 1.00 | 1.00 | Modulating - FS |
| GMA163.1E | 1.00 | 1.00 | 1.00 | 1.00 | Modulating - FS |
| GMA163.1P | 1.00 | 1.00 | 1.00 | 1.00 | Modulating - FS |
| GMA163.1U | 1.00 | 1.00 | 1.00 | 1.00 | Modulating - FS |
| GMA164.1E | 1.07 | 1.12 | 1.00 | 1.12 | Modulating - FS |
| GMA164.1U | 1.07 | 1.12 | 1.00 | 1.12 | Modulating - FS |
| GMA166.1E | 1.07 | 1.12 | 1.00 | 1.12 | Modulating - FS |
| GMA166.1P | 1.07 | 1.12 | 1.00 | 1.12 | Modulating - FS |
| GMA166.1U | 1.07 | 1.12 | 1.00 | 1.12 | Modulating - FS |
| GMA221.1U | 1.00 | 1.11 | 0.64 | 1.11 | 2P- FS (2 Wire) |
| GMA226.1U | 1.07 | 1.23 | 0.64 | 1.23 | 2P- FS (2 Wire) |
| GMA321.1E | 1.00 | 1.11 | 0.64 | 1.11 | 2P- FS (2 Wire) |
| GMA326.1E | 1.07 | 1.23 | 0.64 | 1.23 | 2P- FS (2 Wire) |
| GNP151.1P | 1.32 | 0.96 | 2.03 | 0.96 | Modulating - FS |
| GNP156.1P | 1.38 | 1.08 | 2.03 | 1.08 | Modulating - FS |

| Article Type | Manufacturing | Distribution | Operation | End-of-Life | Control type* |
|---|---|---|---|---|---|
| GNP191.1E | 1.32 | 0.96 | 1.99 | 0.96 | 2P- FS (3 Wire) |
| | | | 2.01 | | 3P-Floating - FS (4 Wire) |
| | | | 2.01 | | Modulating - FS |
| GNP191.1P | 1.32 | 0.96 | 1.99 | 0.96 | 2P- FS (3 Wire) |
| | | | 2.03 | | 3P-Floating - FS (4 Wire) |
| | | | 2.03 | | Modulating - FS |
| GNP196.1E | 1.38 | 1.08 | 1.99 | 1.08 | 2P- FS (3 Wire) |
| | | | 2.01 | | 3P-Floating - FS (4 Wire) |
| | | | 2.01 | | Modulating - FS |
| GNP196.1P | 1.38 | 1.08 | 1.99 | 1.08 | 2P- FS (3 Wire) |
| | | | 2.03 | | 3P-Floating - FS (4 Wire) |
| | | | 2.03 | | Modulating - FS |
| GNP197.1P | 1.32 | 0.96 | 1.99 | 0.96 | 2P- FS (3 Wire) |
| | | | 2.03 | | 3P-Floating - FS (4 Wire) |
| | | | 2.03 | | Modulating - FS |

Wiring schematics for control type

| Open/Close (SpringReturn) | Open/Close | Open/Close | 3-Position | 3-Position (Spring Return) | Modulating |
|---|---|---|---|---|---|
| | SPST | SPDT | - | | - |
|  |  |  |  |  |  |



*Operation profiles for air damper actuators

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Theilerstrasse 1a

6300 Zug

Switzerland

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